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ABSTRACT

This paper describes a study by Project ACCESS (Addressing Computer Concerns of Educators of Special Students) in Michigan to ascertain the existing level of knowledge and use of technology in special education. Analysis of questionnaires returned by 266 local education agency personnel and 266 intermediate school district (ISD) personnel indicated the following findings: early respondents tended to be more "computer literate" than later respondents; most respondents indicated they had integrated technology (usually microcomputers and speech synthesizers) into their educational setting; most respondents had access to microcomputers and had received some recent computer training; training was received from friends and coworkers, ISDs, local districts, and colleges; information about technology was usually acquired through magazines/newspapers, coworkers, personal experience, and television; most respondents were aware of Project ACCESS and its newsletter; few respondents utilized modems or accessed electronic bulletin boards; and most respondents felt that technology had helped reduce barriers and decrease their students' disabilities. Perceived training needs were in the areas of microcomputers, computer-assisted instruction, adaptive equipment, and word processing. Respondents had limited knowledge of basic technology and technology uses and limited experience with technology, but believed in the importance of integrated technology in the educational setting. Appended are a list of respondent categories and questionnaire analysis details. (Author/DB)

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Use of Technology by Special Education Personnel

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Introduction

The use of technology in special education has been a thrust of the Michigan Department of Education, Special Education Services for many years. The major vehicle that has been used to disseminate information about technology in special education has been Project ACCESS.

Project ACCESS (Addressing Computer Concerns of Educators of Special Students) is a clearinghouse for information about technology in special education. The Project ACCESS clearinghouse came into existence in 1983 and continues today through a series of state initiated project grants.

The clearinghouse has had the following responsibilities:

- maintaining an electronic bulletin board
- development and distribution of a model plan for local districts to use for technology infusion
- publication of a multiple issue technology newsletter
- conducting both instructional and administrative professional development activities pertaining to technology
- provide technical assistance to special education administrators in areas of database management, spreadsheets, wordprocessing, and other computer assisted management tasks
- identify and support educational research and evaluation activities related to technology
- support a statewide special interest group (SIG)
- provide mini-grants for special education programs in need of computer hardware
- development and implementation of a Michigan Monitoring System and a Registry Management System.

The first phase in determining the effectiveness of this project is to ascertain the existing level of knowledge and use of technology in special education.

Use of Technology by Special Education Personnel

Population and Sample

The population for this study was composed of special education teachers, teacher consultants, and support personnel identified from the 1990–91 Special Education Services personnel database. A panel of experts knowledgeable of Michigan areas of approval were used to select the most appropriate audience to receive the technology questionnaire (see Appendix A).

Two random samples were selected from the population using an SPSS–X sampling routine. One sample consisted of 375 Local Education Agency (LEA) (local school district) personnel and the second sample of 346 consisted of Intermediate School District (ISD) personnel.

Response Rate

LEA:

A total of 266 (71%) usable questionnaires were returned for analysis. Three unique response patterns were identified. Early, late, and non–respondents were compared using the Mann– Whitney U–test and all possible combinations of the groups, taken two at a time. Four variables out of twelve indicated a significant difference between groups. Early respondents tended to have integrated technology, had greater access to a computer, had more knowledge of the ACCESS newsletter than late respondents and more knowledge of Project Access than non–respondents.

Kendall's Coefficient of Concordance was calculated to determine the general level of agreement among the three groups of respondents. A Chi–Square value of 852.97 and a p–value of less than .001 indicated that these groups tended to agree with each other pertaining to specific questions on the survey instrument. Based upon the Kendall's W and general character of the four variables in question is was determined that the significant differences were not a threat to the validity of the study. All data from the three response groups were pooled for further analysis.

ISD:

A total of 266 (77%) usable questionnaires were returned for analysis. Three unique response patterns were identified. Early, late, and non–respondents were compared using the Mann– Whitney U–test and all possible combinations of the groups, taken two at a time. One variable out of twelve indicated a significant difference between groups. Early respondents tended to have more knowledge of the ACCESS newsletter than late respondents.

Kendall's Coefficient of Concordance was calculated to determine the general level of agreement among the three groups of respondents. A Chi-Square value of 852.97 and a p-value of less than .001 indicated that these groups tended to agree with each other pertaining to specific questions on the survey instrument. Based upon the Kendall's W and general character of the one variable in question is was determined that the significant difference was not a threat to the validity of the study. All data from the three response groups were pooled for further analysis.

A third analysis to determine the difference between groups was made using the LEA and ISD responses as unique groups.

These two groups were compared using the Mann-Whitney U-test. One variable out of twelve indicated a significant difference between groups. ISD personnel tended to have more knowledge of Project ACCESS than respondents from LEAs.

Kendall's Coefficient of Concordance was calculated to determine the general level of agreement among the two groups of respondents. A Chi-Square value of 1634.66 and a p-value of less than .001 indicated that these groups tended to agree with each other pertaining to specific questions on the survey instrument. Based upon the Kendall's W and general character of the one variable in question is was determined that the significant differences were not a threat to the validity of the study. All data from the two response groups were pooled, when appropriate, for further analysis.

The survey instruments also had five attitudinal domains. These domains were divided evenly between ISDs and LEAs. When considering the five attitudinal domains, analysis of variance indicated that there was no significant difference between response groups and their responses to the domains of expertise, knowledge of the basics of technology, and integration.

Two attitudinal domains, experience and knowledge of using technology, had a significant difference between the early response group and the late and nonresponse groups.

Validity and Reliability

The questions included in the survey instrument were derived from specific criteria developed by Special Education Services and this researcher. The large number of questions made it necessary to develop and distribute two questionnaires. Half of the knowledge and experience questions were sent to every other individual in the ISD and LEA samples. The other half of the knowledge and experience questions were sent to the remaining individuals in the ISD and LEA samples. Content validity was established by a panel of experts knowledgeable of the use of technology in special education. Two groups of questions were used as ipsative measures of knowledge and experience. Construct validity of these two groups of questions was developed via factor analysis using principal component analysis and Varimax rotation. This procedure yielded high factor loadings within a single function for each group of questions (see Table 1).

TABLE 1

Factor Analysis of Domains

Domain	Eigenvalue	Percent of Variance
Knowledge of basic technology	2.33	77.5
Importance	7.35	56.6
Knowledge of using technology	16.00	57.1
Experience	17.51	58.4

Questionnaire Domain Scales

The reliability of the five domains of ipsative statements was established using Cronbach's Alpha. Listed in Table 2 are the results of the reliability analyses. All of the domains had relatively high Cronbach Alpha coefficient indicating a high degree of reliability.

TABLE 2

Cronbach's Alpha Reliability Coefficient For Attitudinal Domains

Domain	Cronbach's Alpha
Knowledge of basic technology	.97
Importance	.97
Knowledge of using technology	.94
Integration	.84
Experience	.93

Results

[Note: The following results are pooled data from all ISD and LEA respondents.]

When asked whether or not they had integrated or used technology in the educational setting, the majority (419, 79%) of the special education personnel indicated yes. Listed in Table 3 are the types of technology for those that indicated they had integrated technology into their educational setting. The major types of technology utilized were microcomputers and speech synthesizers.

TABLE 3

Types of Technology Integrated into the Educational Setting

Type	Frequency	Percent
Microcomputer	356	87.7
Speech Synthesizer	101	24.9
Calculator	37	9.1
WOLF Augmentation Communication Device	32	7.9
Switches	23	5.7

(Others with less than five percent include Braille to Print Units, Touch Windows, CD-ROM, video camera/VCR)

In addition to the type of technology, these individuals were asked where they received the information or training for this technology. Displayed in Table 4 is a listing of their responses. Co-workers was the most mentioned category followed by college, ISD, personal reading and LEAs.

TABLE 4

Sources of Technology Information/Training

Type	Frequency	Percent
Co-worker(s)	99	25.1
College	68	17.2
ISD	66	16.7
Personal Reading	63	15.9
LEA	61	15.4
Computer Tutorials	53	13.4
Workshops	47	11.9
Commercial Firm	23	5.8

(Others with less than five percent include Software Documentation, Access, LLRC, Friend, OJT, REMC, Conferences)

Four hundred and nineteen (79.2%) of the respondents indicated that they had access to a microcomputer. When asked whether they had received microcomputer training over the past five years 279 (52.5%) indicated yes. The major sources of training for those that answered yes were ISD, friend, college, and LEA (see Table 5).

TABLE 5

Sources of Microcomputer Training

Type	Frequency	Percent*
ISD	128	30.6
Friend	80	19.1
College	60	14.4
LEA	58	13.9
ACCESS	17	4.1
Commercial Firm	15	5.8
SIG	15	3.6
Adult Education	10	2.4
Community College	10	2.4
MDE	5	1.2

*Percentages do not add to 100% due to multiple responses.

Closely associated with microcomputer training is whether or not the respondent had received training in the use of a modem. Fifty nine (11%) of the respondents indicated that they had received this type of training. The major source of training for those that answered yes was friend (see Table 6).

TABLE 6

Sources of Modem Training

Type	Frequency	Percent
Friend	24	41.4
College	8	13.8
ISD	8	13.8
LEA	8	13.8
Commercial Firm	6	10.3
ACCESS	4	7.0
MDE	3	5.2
Community College	3	5.2

When asked what sources they use to find out about technology (see Table 7) the majority of the respondents indicated the use of magazines and newspapers.

TABLE 7

Sources of Technology Information

Type	Frequency	Percent
Magazines/Newspapers	267	53.7
Co-Worker	156	31.5
Personal Experience	115	23.1
Television	107	21.5
Mailed Advertisements	89	17.9
Project ACCESS	62	12.5
Workshops/Inservices	60	12.1
Newsletters/Bulletins	49	9.9
Friends	46	9.3
Radio	44	8.9
Journals	37	7.5

(Others with less than five percent include conferences, ISDs, LEAs, colleges, LLRC, Manuals, SIGs, Commercial Firms, professional organizations, PAM, books)

When asked whether or not they were aware of an electronic bulletin board system that is specifically for special educators use, 85 (16.1%) indicated yes. The largest portion of the respondents indicated that the bulletin board service was maintained by Project ACCESS, ISDs and Special-Net (see Table 8).

TABLE 8

Electronic Bulletin Board Sponsors

Type	Frequency	Percent
ACCESS	17	25.0
ISD	14	17.0
Special NET	9	13.2

(Others with less than five percent include APPLE, colleges, CEC, Compuserve, Greater Detroit Society for the Blind Network.)

Eighty five (16.1%) of the respondents indicated that they were aware of special education special interest groups (SIGs). For those 85 that were aware of a SIG, 30 (21.9%) were members. The various sponsors of these SIGs are listed in Table 9. These individuals also felt that membership was moderately useful to them (see Table 10).

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TABLE 9

Special Education Special Interest Group Sponsors

Type	Frequency	Percent
ACCESS	21	21.4
ISD	16	16.3
MACUL	11	11.2

(Others with less than five percent include CEC, PAM, MDE, LLRC, Special-Net, professional organizations, LEA.)

TABLE 10

Perceptions of Special Education Personnel Toward the Usefulness of Special Interest Groups

Type	Frequency	Percent
Barely Useful	7	12.5
Slightly Useful	2	3.6
Somewhat Useful	13	23.2
Moderately Useful	17	30.4
Quite Useful	5	8.9
Very Useful	12	21.4
Total	56	100.0

Summary Statistics: X=4.8, Mdn=5.0, Md=5.0, sd=1.6

When asked if technology has helped to reduce any of their students' barriers to learning, 354 (71.4%) indicated yes. In addition, the majority (313, 64.3%) of the special education personnel felt that technology helped to minimize their students' disabilities.

The majority of the respondents (374, 70.3%) were aware of the access newsletter and 320 (60.6%) were aware of Project Access.

The special education personnel indicated that they would like to receive some training pertaining to microcomputers, computer assisted instruction, adaptive equipment, and wordprocessing. A complete listing of the desired training areas are listed in Table 11.

TABLE 11

Training Needs Identified by Special Education Personnel

Type	Frequency	Percent
Microcomputers	127	23.8
Available Software	73	13.7
Computer Assisted Instruction	47	8.8
Adaptive Equipment	44	8.2
Speech Synthesizers	38	7.1
Wordprocessing	28	5.2

(Others with less than five percent include reading, program integration, CD-ROM, fund sources, databases, programming, technology update, merging data with reports)

Knowledge of basic technology, Experience, Knowledge of using technology, Importance and Integration

There were five attitudinal domains that measured the level of knowledge of basic technology, experience, knowledge of using technology, importance and integration

The knowledge of basic technology domain consisted of sixteen statements and measured how knowledgeable the respondent was of hardware and related components. The mean score of 48.9 (sd=18.8), median of 48 and a mode of 32 are all below the midpoint value of 64 and indicate that the respondents had a limited amount of knowledge.

The knowledge of technology uses domain consisted of 28 statements and measured the respondents level of knowledge of technology use, implementation of technology, evaluation of technology, and characteristics of adaptive device categories. The mean score of 69.0 (sd=33.12), median of 63 and mode of 28 were all below the midpoint value of 98 and indicated little knowledge of these statements.

The experience domain (K=30) had a mean score of 71.2 (sd=39.27), a median score of 60 and a mode of 30. All these measures are below the midpoint value of 120 and indicated that the respondents had limited experience using technology.

The importance domain (K=13) had a mean score of 73.0 (sd=12.8), a median of 75 and a mode of 91, all of which are above the midpoint value of 52. These figures indicate that the respondents viewed the evaluation of technology, implications of various laws, and the use of technology in the classroom as being important.

The final domain of interest pertains to the integration of technology into the special education curriculum (K=3). A mean of 17.2 (sd=3.56), a median of 18 and a modal score of 21 are all above the midpoint value of 12 indicating the respondents generally agreed with the need for integrating technology into the educational setting.

Located in Appendix B are the items that comprised the domains. These items are listed in descending order, irrespective of domain with their corresponding descriptive statistics. It should be noted that test-retest item reliability was not conducted.

Summary

Early respondents tended to be more "computer literate" than later respondents. Future studies collecting information about technology and especially microcomputers should be sensitive to this finding.

The majority of the respondents indicated that they had integrated technology into their educational setting. The major items integrated were microcomputers and speech synthesizers. Most of the respondents had access to microcomputers and had received some type of recent training concerning computers. The respondents received training from four general sources, friends and co/workers, ISDs, local districts, and colleges.

Information about technology was generally acquired through magazines/newspapers, co-workers, personal experience, and television. The majority of the respondents knew about Project ACCESS and the access newsletter. Few of the respondents utilized modems or accessed electronic bulletin boards. The respondents felt that technology had both helped reduce barriers and decrease their students' disabilities.

The perceived training needs were microcomputers, computer assisted instruction, adaptive equipment and wordprocessing. As a general rule, the respondents had limited knowledge of basic technology, technology uses, and experience with technology. These individuals were in general agreement that technology is important and that it should be integrated into the educational setting.

Appendix A

Instructional Personnel

Educable Mentally Impaired
Trainable Mentally Impaired
Severely Mentally Impaired
Emotionally Impaired
Learning Disabled
Hearing Impaired
Visually Impaired
Physically & Otherwise Health Impaired
Severely Multiple Impaired
Preprimary Impaired
Speech/Language Impaired
Autistic Impaired
Resource Room

Teacher Consultant Personnel

Mentally Impaired
Emotionally Impaired
Learning Disabled
Hearing Impaired
Visually Impaired
Physically & Otherwise Health Impaired
Preprimary Home Program/Ancillary Service Staff
Homebound/Hospitalized
Teacher of Speech/Language Impaired Nonclassroom Program
Physical Education for the Handicapped

Special Education Support Personnel

Curriculum Resource Consultant
Occupational Therapist
Physical Therapist
Registered Music Therapist
Orientation and Mobility Specialist
Registered Recreational Therapist
Work Study Coordinator
Registered Art Therapist

Technology Competencies

QUESTION	$\bar{X}$	SD	MDN	MD
Familiarity with documentation for your adaptive devices.	1.705	1.643	1.000	.000
Use hardware and software for computer networks.	1.723	1.298	1.000	1.000
Use hardware and software for telecommunication software.	1.734	1.395	1.000	1.000
Developing and coordinating a team for the allocation of resources in the usage and evaluation of adaptive devices.	1.833	1.150	1.000	1.000
Evaluate software for other considerations.	1.851	1.304	1.000	1.000
Develop evaluation plans for the use of technological devices that are applicable to specific populations.	1.884	1.367	1.000	1.000
Identifying and remedying common problems with adaptive devices.	1.886	1.285	1.000	1.000
Use hardware and software for shell programs adaptable to individualized content material.	1.894	1.462	1.000	1.000
Identifying and remedying common problems with hardware.	1.919	1.380	1.000	1.000
Develop evaluation plans for the use of technological devices that are applicable to specific situations and/or educational systems.	1.919	1.406	1.000	1.000
Use hardware and software for computer managed instruction (CMI).	1.935	1.510	1.000	1.000
Characteristics of adaptive device categories: tactile output.	1.955	1.395	1.000	1.000
Evaluate software for technical adequacy.	2.044	1.477	1.000	1.000

Note: Scores could range from 1 (None) to 7 (Extensive). Midpoint value=4.

QUESTION	$\bar{X}$	SD	MDN	MD
Have directed experience utilizing adaptive devices that compensate for specific student deficits.	2.048	1.526	1.000	1.000
Characteristics of adaptive device categories: modified displays.	2.049	1.439	1.000	1.000
Identifying and remedying common problems with software.	2.049	1.447	1.000	1.000
Familiarity with documentation for your hardware.	2.080	1.724	2.000	1.000
Evaluate software for adaptive devices.	2.081	1.476	1.000	1.000
Conducting an appropriate evaluation of software for technical adequacy.	2.082	1.412	2.000	1.000
Conducting an appropriate evaluation of software for compatibility with hardware and adaptive devices.	2.111	1.471	2.000	1.000
Use hardware and software for utilities software.	2.161	1.665	1.000	1.000
Organize and manage technology for effective use in the classroom or laboratory.	2.186	1.464	2.000	1.000
Use hardware and software for adaptive devices.	2.197	1.544	2.000	1.000
Use of microcomputer networks.	2.199	1.381	2.000	1.000
Questions that need to be answered before the purchase of an adaptive device.	2.208	1.460	2.000	1.000
Familiarity with documentation for your software.	2.242	1.879	2.000	1.000
Evaluation of adaptive devices other than for instructional uses.	2.243	1.453	2.000	1.000
Write lesson plans which integrate technology into specific skills to handicapped students.	2.254	1.606	2.000	1.000
Characteristics of adaptive device categories: special needs software.	2.290	1.540	2.000	1.000

Note: Scores could range from 1 (None) to 7 (Extensive). Midpoint value=4.

QUESTION	$\bar{X}$	SD	MDN	MD
Use of telecommunications.	2.300	1.393	2.000	1.000
Characteristics of adaptive device categories: speech and other non touch input.	2.306	1.571	2.000	1.000
Evaluate the appropriateness of hardware, software and adaptive devices for meeting the needs of students with disabilities.	2.359	1.610	2.000	1.000
Characteristics of adaptive device categories: alternative switches.	2.374	1.699	2.000	1.000
Use hardware and software for database management.	2.382	1.835	2.000	1.000
Characteristics of adaptive device categories: speech output.	2.392	1.633	2.000	1.000
Characteristics of adaptive device categories: touch-sensitive input devices (alternate keyboards)	2.398	1.645	2.000	1.000
Conducting an appropriate evaluation of software for instructional information.	2.433	1.622	2.000	1.000
Evaluation of hardware for instructional uses.	2.439	1.571	2.000	1.000
Conducting an appropriate evaluation of software for educational adequacy.	2.445	1.630	2.000	1.000
Evaluation of adaptive devices for instructional uses.	2.463	1.567	2.000	1.000
Evaluate software for instructional information.	2.514	1.709	2.000	1.000
Evaluate software for educational adequacy.	2.516	1.721	2.000	1.000
Use of technology to compensate (modify) control of the environment.	2.539	1.480	2.000	1.000
Use of technology to compensate (assist) mobility.	2.568	1.583	2.000	1.000
Technologies' potential role in the input-output informational processing model.	2.569	1.626	2.000	1.000

Note: Scores could range from 1 (None) to 7 (Extensive). Midpoint value=4.

QUESTION	$\bar{X}$	SD	MDN	MD
Resources available for assistance with using technology with the handicapped.	2.575	1.504	2.000	1.000
Conducting an appropriate evaluation of software for appropriateness in meeting the needs of the handicapped.	2.602	1.731	2.000	1.000
Resources available for information about using technology with the handicapped.	2.656	1.508	2.000	2.000
Use hardware and software for working files or programs on a hard-disk drive.	2.676	2.032	2.000	1.000
Knowledge of the input-output information processing model.	2.709	1.680	2.000	1.000
Use of technology to improve skills for vocational activities.	2.761	1.537	3.000	1.000
Use of technology to improve skills for basic living skills.	2.775	1.570	3.000	1.000
Evaluation of software for instructional uses.	2.800	1.690	3.000	1.000
Use simulation software.	2.895	2.019	2.000	1.000
Use hardware and software for copying selected files from one disk to another.	2.980	2.101	2.000	1.000
Use problem solving software.	3.081	2.029	3.000	1.000
Use hardware and software for backing up (copying) a disk.	3.109	2.143	2.000	1.000
Use hardware and software for formatting a disk.	3.258	2.170	3.000	1.000
Use technology to store and manipulate data.	3.287	1.741	3.000	1.000
Present uses of technology for effective living for the handicapped.	3.318	1.509	3.000	4.000
Use of technology to compensate (assist) communication.	3.336	1.664	3.000	3.000
Understand/Use technology terms.	3.401	1.541	3.000	4.000
Present uses of technology in the world of work.	3.410	1.480	3.000	4.000

Note: Scores could range from 1 (None) to 7 (Extensive). Midpoint value=4.

QUESTION	$\bar{X}$	SD	MDN	MD
Use of technology to improve skills for leisure time activities.	3.420	1.736	3.000	3.000
Use tutorial software.	3.452	2.168	3.000	1.000
Understand/Use microcomputer terms.	3.482	1.560	4.000	4.000
Use hardware and software for word processing.	3.590	2.193	3.000	1.000
Use drill and practice software.	3.609	2.164	4.000	1.000
Use hardware and software for "booting" up a program.	3.649	2.223	3.500	1.000
Use of technology to improve skills for learning.	3.748	1.594	4.000	4.000
Appropriate care of a microcomputer.	3.823	1.763	4.000	4.000
Recognize the component parts of a microcomputer.	3.863	1.717	4.000	4.000
Recognize the functions of a microcomputer.	4.033	1.659	4.000	4.000
How much knowledge should students with disabilities have of technology?	4.792	1.703	5.000	5.000
Using authoring systems. [e.g., Hypercard, Hypertext]	4.911	1.583	5.000	4.000
Implications of licensing laws on the implementation of technology applications with the school setting.	5.182	1.472	5.000	4.000
Implications of copyright laws on the implementation of technology applications within the school setting.	5.198	1.558	5.000	7.000
Using telecommunications and networks.	5.252	1.466	5.000	7.000
Implications of Family Educational Rights and Privacy Act (FERPA) on the implementation of technology applications within the school setting.	5.315	1.591	6.000	7.000
Is the integration of technology into the educational system/curriculum cost effective?	5.366	1.602	6.000	7.000

Note: Scores could range from 1 (None) to 7 (Extensive). Midpoint value=4.

QUESTION	$\bar{X}$	SD	MDN	MD
Using computer managed instruction (CMI).	5.441	1.339	6.000	7.000
Using shell programs adaptable to individualized content material.	5.522	1.470	6.000	7.000
Using computer assisted instruction (CAI).	5.733	1.270	6.000	7.000
Using emerging technology.	5.743	1.223	6.000	7.000
Is there a need for students with disabilities to understand and use technology.	5.811	1.324	6.000	7.000
Using application software.	5.820	1.141	6.000	7.000
Do we need to integrate technology into the curriculum for students with disabilities?	6.026	1.225	6.000	7.000
Using adaptive devices.	6.027	1.307	6.000	7.000
Ways of integrating technology into the educational system/curriculum.	6.290	1.025	7.000	7.000
How important is the evaluating of technology prior to purchasing equipment with the technology.	6.496	.958	7.000	7.000

Note: Scores could range from 1 (None) to 7 (Extensive). Midpoint value=4.